

## AIS Altitude Training Camp - 2000

### AUSTALIAN INSTITUTE OF SPORT ALTITUDE CAMP AT U.S. OLYMPIC TRAINING CENTER March 28- April 18, 2000

A team of 5 swimmers from the Australian Institute of Sport (AIS) came to Colorado Springs, CO for a 21-day altitude training camp. They traveled to Colorado directly from Canberra, Australian and returned to AIS following the camp. This was one of three training camps pursued by squads of the AIS swimming team during this period. The camp is the last heavy training cycle before the Australian Olympic Trials, which begin on May 15, 2000.

The team for this camp consisted of five athletes (Sarah Ryan, Alex Popov, Mathew Dunn, Edward Roche, and Michael Klim), head coach Gennadi Touretski, and AIS sport's physiologist David Pyne. USA swimming staff members were present as observers at all training sessions with the exception of Day 1.

#### **Coaching Staff**

Gennadi Touretski, Senior Coach AIS

Excellent distance swimmer for the USSR and graduated with master's degree in Engineering (emphasis in Biomechanics and Biochemistry). Began coaching in St. Petersburg, experiencing success with a group he began coaching as 8 year olds and followed through International competition. In 1982 he established an Olympic Training Center in Samara, Russia, and coached 30% of the Russian Olympic Team in 1988 and 1992.

He was on the coaching staff at AIS from 1993-2002. He is currently coaching in Switzerland. He has several business interests outside of AIS including projects with companies owned by both Popov (technical CD-ROM) and Klim (strength/power equipment).

Achievements:

1964-1973 USSR National swim team member (distance Freestyle)

1988 - Head coach USSR swim team Seoul Olympic Games

1992 - Head coach USSR swim team Barcelona Olympic Games

1993-Finalist in the World Swimming Coaches Association "Coach of the Olympiad"

1996 - Coach Australian swim team Atlanta Olympic Games

Swimmers recently in his program have included: Matthew Dunn , Michael Klim, Alexander Popov, Vladimir Pyshnenko, Sarah Ryan, Petria Thomas, and Nicole Stevenson

#### **David Pyne PhD., Senior Sports Physiologist AIS**

Dr. Pyne has been at AIS since 1987. He is one of the leading sports scientists in Australia and has a practical as well as scientific focus. He has published over 120 articles in the last decade most of which are for a coaching/athlete population, but he also has had research papers in many of the world's top scientific journals. His

primary focus has been immune response markers (white blood cell differentials and salivary IgA) in athletes and their relation to illness.

He also worked as a team leader in an international project to develop (and gain IOC approval) for tests to detect EPO and Human growth hormone use by athletes in time for the Olympics in Sydney. In addition to work at AIS he works with Australian Rules football league and the AIS cycling program. He was a member of the Australian swimming support staff at the Olympics in 2000.

### **Training**

The team trained 20 days with one full day off (day 11). The training load consisted of 34 water sessions, 4 “gym” sessions, 4 aerobic “walks”, and 5 recovery massages. General schedule was three double practice days followed by a single. Touretski’s training model for this part of the macrocycle would normally dictate triple workouts, but the relatively high altitude and close proximity to the Olympic trials caused him to go with doubles. The training plan for the camp was broken into 6 microcycles of 3 or 4 days with primary emphasis on acclimatization and anaerobic threshold training. Touretski’s smallest training block is 3 to 5 workouts, not one practice or one day. He did not seem to use a specific system of categorizing energy systems in training. He identified lactate levels for aerobic and anaerobic threshold, which indicates he probably uses a 5-zone system from European swimming. Standard terms in discussion of training plan were “aerobic”, “threshold”, “VO<sub>2</sub>max”, “anaerobic”, and “skill”(alactate).

All swimmers trained together for most of the camp. Only 5 water sessions had multiple workout groups, which were based on training emphasis in the last microcycle of the camp. The total volume for camp 213,700 meters (average=10,200m per day/peak=15,200m). Popov arrived two days late and he and Dunn both missed a practice due to illness. Popov’s camp volume was 191,000m.

### **Training Cycles/Organization**

This altitude camp was part of a 16-week training cycle that was repeated twice between January 6 and the Olympics. The distinct breakdowns of the training plan for this group include the following levels: Olympic (Quadrennial), World Championship (2 year), Annual preparation (October to August), Macrocycles (16-18 week), mesocycles (2-7 week emphasis blocks-this altitude training camp), and microcycles (3-5 days). See appendix for visual representation of macrocycle and this altitude camp.

- The Quad focus was most general and most variables based on athlete’s phase of development. It generally followed the pattern 1-year of recovery/maintenance, 2 years of general fitness development/competition, and 1 year of specific training and peak competition.
- The World Championship cycle was more focused on competitive experience and individual athlete career/economic development based on the international importance of that meet.
- Annual training followed a general pattern of post competition break (3-12

weeks), general training (8-12 weeks), specific training macrocycle (16-18 weeks), competitive cycle (1-3 weeks), specific training macrocycle (16-18 weeks), and peak competition (3-5 weeks).

- Macrocycle for this Olympic preparation focus on specific training and are designed around competition.
- Always build the mesocycles
- Microcycles had specific training focus and consisted of 3-5 day blocks.

The training was not consciously divided into workouts, days, or weeks as most programs around the world. The smallest unit of planning is the microcycle of 3-5 days and themes or performances are evaluated over that period not individual sets or workouts. Rest days are taken at whatever point they are warranted rather than corresponding to a weekend day, though Touretski acknowledged that facility and social issues influenced him.

This altitude camp training included two water session per day. Typically at this stage of the macrocycle training it would involve triple water sessions (7-9am, 3-5pm, and 7-9pm) with a volume of 15-16,000m, however because of the close proximity to Australian Olympic Trials (6 weeks out), relatively acute altitude, and the potential rapid weather changes, a more conservative double practice schedule was chosen.

During this altitude camp Touretski was in discussion with Don Talbot (former National Team Director for Australia) to plan the logistics of the remaining macrocycle leading to the Olympics. His desired structure was to return to the United States for another altitude cycle, which would conclude with a peak competition at the Janet Evans Invitational in Los Angeles July 13-16. In planning all training cycles Touretski felt that the most important component was to fit the training around proper competition opportunities.

### **TRAINING BREAKDOWN/ENERGY SYSTEM CATEGORIZATION**

Touretski tracked training volume, but has seldom recorded specific sets or workouts during his time at AIS (Pyne). He manages the training objective of sets using distance, speed, and work to rest ratio, however he did not discuss a system of classification for energy systems or workload. His primary reference points were aerobic threshold (Pyne's definition-around 2mm of Lactate) and anaerobic threshold (around 4 mm of lactate). The emphasis of the sets were described in terms of "aerobic", "threshold", "VO2 max", "anaerobic" (two types "lactate tolerance" and "lactate utilization"), and "skill" (alactate-ATP/CP training). These may correspond to a 5-zone Eastern European classification system given his Russian background, but the program used no consistent terminology to classify energy systems. It seems that he focused more on general physiology of each athlete rather than a specific breakdown of contributing energy /metabolic systems.

### **General Observations: Water sessions**

- During acclimation phase used long warm up swims of 1200-2000 straight

usually starting with fins and paddles

- In addition to pulling, loaded swimming with drag suits for men and towed bundle of sponges (Ryan)
- Used short fins-very flexible
- Used medium sized flat square paddles for longer pull sets
- Used fingertip paddles for fast pulling in all strokes (swimmers often used for during “swim” sets as well-Popov did majority of his volume backstroke with fingertip paddles)
- Kick was primarily with a board
- Often did fast swims off the blocks with no warm-up
- End practice with 50 time trials
- Did not tow (do often at home)
- Carried length and structure of sets through the day (i.e. 100s threshold in both am and pm-“muscle memory”)

### **General Observations: Athletes**

- Very aware and interactive with feedback (HR, time, Lactate, Stroke count) during training
- Extremely “professional” and positive attitude under heavy training load
- Sprinters were remarkably durable under high volume and increasing intensity
- All athletes stretched a minimum of 15 minutes before workout focused on arms
- Negative split most swims
- Tend to descend stroke rates within swim
- Lower stroke rates on a-lactate/fast sections of swims (focused on 50m+ race distance)
- Kick was deceptively fast (very little splash)
- Swam fast anytime under any condition (Dry start no warm-up, in middle of long threshold set, pulled out of Jacuzzi after practice...etc)
- Poor kickers (Ryan) go sets with fins(produce higher lactates)
- Body type of men similar (large upper torso, relatively short legs---except Popov)

### **General Observations: Technique**

- The only negative and critical feedback from coach to swimmers was in response to lazy or poor technique
- Technique was constant focus. Recovery swims and warm-up always SLG=“slow look good”
- Emphasized importance of “rigid” system: Minimize vibration or sculling motion in all strokes
- Drills for freestyle and backstroke focused on rotation
- Discussion on fly and breast technique focused on flexibility of the hips while maintaining rigid body and leg position
- Athletes were pulled out of sets for 15 to 20 minutes of individual stroke work if struggling with stroke count or technique
- Flyers pulled often with buoy and finger tip paddles
- All athletes did a drill with fins and paddles --head up/dolphin kick/FR stroke

(Klim's finish technique)

Touretski's Training Group and Interaction with Athletes

"There are two kinds of swimmers, those who can control their environment and potatoes."

Touretski is very straightforward in explaining that he created this group and training environment to develop Olympic Champions. He doubts that the situation and environment could be duplicated and is unique to his coaching style and the nature of Australian swimming. His distinctive coaching characteristics/philosophies regarding the development of athletes in his program are that he individualizes his training and interaction (see section on individualized training) with each athlete and that he attempts to empower athletes by giving them responsibility for their preparation and the tools to help them succeed. They are required to take ownership and responsibility for their own success or failure. Most of his frustration or negative feedback during training focuses not only on the errors made, but disappointment in the athletes' failure to take responsibility for their training.

His interaction with athletes and training design is very individualized, which does not seem to cause problems or jealousy in the group. The athletes have extreme respect for him and appreciate his support and focus on their interests beyond the pool (Touretski commented that the vast majority of his champion swimmers were extremely talented in areas outside of swimming. He felt that this balance in life help their mental approach and creativity).

The athletes did recognize some shortcomings in their coach and were not shy about teasing him about them, or discussing them. The respect and strong relationship with their coach, as well as their excellent individual performance leads to long periods in the program. Touretski is proud of this, and sees it as a huge benefit to an athlete's long-term development. Roche had the shortest tenure with the group (2 years) followed by Ryan (4 years), Dunn and Klim (7 years), and Popov (10 Years).

Ten minutes before practice Touretski writes workout on the board. He uses no notes and adjusted volumes as he goes, taking about 3 minutes while the athletes watch (and cringe). He talks to each athlete before practice begins giving very focused directions on the workout. This is an important exchange of information and the athletes are focused during this period-no conversation about anything outside of the practice.

### **Testing/Evaluation**

Touretski and Pyne worked very closely together to monitoring athletes and adjusting training. The swimmers received constant feedback during each practice consisting of stroke counts, stroke rates, split times, heart rates and blood lactate testing (most workouts). Athletes had a polar heart rate monitor and David Pyne using a Lactate Pro hand analyzer measured their blood lactate.

Athletes were weighed prior to each practice to determine metabolic changes during the camp (not hydration issues)[SEE SKINFOLD TEST]. They took one sum of skin fold measurement (7 sites) on day 15, which is a testing procedure

they take every two weeks and has significant bearing on training and competition prescription. The team performed a 7x200 Australian standard lactate profile (step test) on Day 16, which influenced decisions on training emphasis for the last two microcycles of the camp

### **Testing Protocol/Equipment**

The athletes were constantly evaluated during their training. Athletes received the majority of the feedback from this testing and were well educated in how to use it to adjust or enhance their training. The basic daily feedback included times, stroke counts, splits, heart rate, body mass, and blood lactate. Intermittent testing performed during the camp included swim bench power testing, skin fold test, lactate step test, blood profile.

Touretski and Pyne discussed results daily to improve the training plan, but the majority of the information was related to the athletes for immediate adjustment of training. The team brought their own digital scale from AIS to standardize the weight measurements. The athletes were weighed only before each practice to look at mass changes that may be associated with loss of fat weight or muscle mass. Each athlete had a predetermined target weight that they were conscious of maintaining. They were aware of hydration status, but did not use the daily weigh-ins to adjust fluid intake.

The heart rate was recorded using Polar heart rate monitors. They had an adapted handle that helped press the electrodes to the chest of the athletes allowing better contact and easier use of the other hand to hold the receiver. The athletes picked up heart rates at all parts of the practice, relating them to the staff on rare occasions. The group seldom took recovery heart rates and the protocol was only one recovery rate 30 seconds after the initial measure. Blood Lactate was measured daily on a range of sets.

Australian swimming has agreed on some standard testing protocols which coaches around the country must use and submit to one of the regional training centers for tracking. One of those test was a lactate profile/"step test" of 7x 200 descending with even steps to max. The protocol is generally 4-minute send-offs depending on the equipment available and the target for each step is a 5-second drop. Popov did a different testing protocol-8x100 FR with 4 steps/lactates descending to maximum effort (3/2/2/1).

He has been doing the test for 15 years and Touretski felt it is more appropriate for sprinters. The results were very positive for all athletes except Roche. Roche had solid velocities, but was not producing high levels of lactate for the effort (10.8) which indicated "blunted" anaerobic capacity. Popov had an exceptional test with both a large shift of the curve to the right around threshold speed, and an elevate lactate production at the max effort Pyne discussed the lactate testing and attempts to determine anaerobic threshold.

Touretski mentioned that he did not like to use assistant coaches in any area, yet he and Dr. Pyne conversed daily regarding testing results and he played integral logistical roles with the program (timing, massage, chauffeur, etc). The athletes were extremely comfortable with "Pine-eee" and conversed freely with him regarding feedback and test results. The ease of conversation and consistent access

to athletes was very different from the present system in the US. Dr. Pyne's opinion and information was valued and considered in all conversations. He had a good feeling for Touretski's program and what level of conversation would be most effective. He offered summaries of the literature, but mostly offered his personal best guess/interpretation of results with out any implied guarantee or scientific conclusion.

### **Skinfold Test**

Australian swimming science went away from body fat percentage in the early '90's. With the lack of accurate formulas based on swimming specific populations and inconsistent testing protocols the use of percentages was extremely inaccurate and caused many problems for coaches and athletes. The use of sum of skin folds and mass is now encouraged by AIS to evaluate changes in body composition. Pyne and Touretski began combining the measures into a ratio (body mass in kg divided by the sum of skin folds in cm), which has become one of the focal tests for evaluation of fitness level/training response, as well as a predictor of competitive performance.

The skin-fold measurements include 7 points (biceps, triceps, sub-scapular, mid-abdominal, lower-abdominal, quadriceps, and calf) taken by the same operator. The ratio is taken roughly every two weeks, and has been recorded on these athletes for up to 6 years. High values for the ratio correlate extremely well to peak performance and low values occur during breaks from training. The change in the ratio is compared to changes in mass to determine if the training response is catabolic in nature. This was of significant concern to Touretski during the altitude camp, as an indicator of overtraining (especially for Popov). The changes also offer hints as to the metabolic processes dominant during different types of training.

The ratio is used to evaluate performance potential and make training adjustments. Sarah Ryan's results led her back into the weight room for three days during the camp, because of a concern over a falling ratio and loss of muscle mass. Popov had one of the largest positive changes of his career during the camp and that information combined with changes in his lactate response to training led to the decision to go an extremely fast time trial on day 17. According to Pyne the ratio also indicates/follows maturity in young athletes. Though graphs of the ratio over time are cyclical in response to training and competition, Klim's results show a general trend upward while Popov is generally flat.

### **Importance of Competition/Race Experience**

One of Touretski's core philosophies is that race velocity swimming and competition experience is crucial for elite athlete development. He feels that this stimulus is important for physical development, skill development, and psychological development. Athletes must be able to swim fast anytime, any place, and under any condition and that translates into consistency in their competitive performances. He emphasized several times that the training plan must include the correct amount of race rehearsal swims, and should be designed around the competition schedule not vice versa.

The number of “starts” is tracked for each athlete during a season. A “start” is considered an off the blocks effort that is performed within 4% of the athletes goal time. It is not always performed under competitive conditions (approximately one third are not). He also incorporates an intense 10-day competition microcycle into training cycles, during which there are several “starts” in each practice session. The athletes also are required to compete in numerous events at the competitions the team attends (sometimes more than 15 starts a weekend).

The key to Touretski’s interest in this component of training seemed to be research done in Russia on the training loads of track athletes. In this study they found that the most successful track sprinters in the world carried a competitive volume of 64,000 meters (between 1-4% of max velocity) a year. This lead him to convert the distance to a relative volume for swimmers (divided 64k by 4-swimming races take approximately 4 times as long for a similar distance) and come up with a target volume of 16,000 meters of race performance for sprinters each year. The goal is 100, 100 meter starts, and 100, 50 meter starts for Popov. They have attained this level two of the last three years.

This was an area that Touretski pointed out the weakness of our college swimming as related to International competition. He pointed out that when Popov steps on the blocks at the Olympic for the 100 meter freestyle he will have 90+ starts in that event over the last 12 months at that relative performance level while the top American swimmers will likely have less than 10 starts at that level, and less then 20 total.

The microcycle focusing on competition (see Appendix\*\*) is 10 days long alternating 3 days on and 1 day off. The training is all race intensity usually beginning practice with a 600 warm-up followed by 1 dive effort then switching to pace work and broken swims.

### **Developmental Swimming In The USA and Australia**

“Club swimming/training is a business they train all swimmers the same and wait for the golden fish.”

Touretski had interesting things to say about the developmental system of most club coaches in Australia and the US. He felt that talent identification and development was focused on serving the masses. Swimming in Australia is driven by basic learn to swim/lessons. Because of high demand and profit the majority of teams are set-up to accommodate many swimmers with limited resources. This causes coaches to manage their training programs in a “one dimensional” model. A one-dimensional model trains everyone in a very restricted training mechanism with the only focus water training and relies on survivors (aka: golden fish) for the elite performances. Because the programs are typically high volume based with low emphasis on technique only “fat and small kids survive”. A “multi-dimensional” approach that Touretski promotes and uses individualizes training design, several types of training sessions in addition to water work, psychological aspects of athlete preparation, and cycled rest. He saw parallels in the United States system and viewed our team as a collection of survivors not representative of the talent available to our country.

Touretski discussed a training/developmental program that he coached in Russia.

He spent 9 months selecting 600 kids at age 8 from the public school system in St. Petersburg. Initial selection criteria centered on anthropometric data and observation of athletic activities (not just swimming). He remained their coach through for the duration of their swimming career (several were transferred to different sports). The results were impressive and he credited the standardization of the program and individualization of training not the selection process.

Development of the St. Petersburg Team

Age 8 600

Age 9 120

Age 10 60

Age 12 40

National Age group Team 26

Russian National Team 7

### **Recovery (Massage/Sauna)**

Touretski talked about sauna used for recovery. At home he had sauna between 9-11 on Sundays for all athletes. They can come in at anytime and have a laid-back swim, sauna, and tea. He feels this is important for psychological recovery (peaking both physiology and psychology). This is the only time he will discuss problems with them, they cannot complain during practice... "Must work... you waste everyone's time." The swimmers had 8 to 9 massages over the three-week camp. They are used strictly for recovery.

### **Altitude Training**

Popov and Dunn did not come to practice because of GI distress. Touretski said he predicted this as a result of adaptation to altitude. He was somewhat frustrated because he had advised them how to prevent it and he did not feel that they had done what he suggested (drink lots of fluids and eat in reliable/customary areas). Touretski talked a great deal about the importance of early part of the camp. Popov had a monster swim and Touretski was excited and interested in talking about why he was able to do it. He felt it as primarily due to the state of readiness he was in at this point (high lactate responses the last three days). He pointed out how careful they were with aerobic/HR work early to prepare the athletes.

He also talked about the nervous system being in an excitable state 3-4 days after returning to sea level and you must be very selective about competition or it will do much damage. Touretski feels threshold work is the best way to develop power (faster speeds are skill) Touretski was very happy with the camp, athletes felt very fresh mentally and were performing well physically.

He also discussed altitude training and the AIS use of artificial altitude. In the AIS physiology lab they have a 10 bed, three room apartment that is used for passive exposure (sleep high train low). It is done through maintaining a hypoxic environment (low O<sub>2</sub> concentration). The standard is 2500m equivalent and the house will be used 130 nights between now and the games. He felt that it was effective for the poorer sports that couldn't take training trips to altitude. He felt there was a significant increase in focus and quality of work during a training

camp environment, but having the altitude effect at home was not as well supported. They had observed no differences in the physiological changes between real and simulated altitude.

### **Touretski On Individualized Training**

“Many coaches actually kill 50 and train 1.”

Today he used a test set of 3x200 at set HR it is one of 10 or 11 sets he uses periodically to let the athletes evaluate their “balance” and adjust their training. Basically, they do a short HR step test and look at time vs. HR, he views this as a tool for the athlete “positive feedback” he does not discuss the results with them because it would be giving them too much information and he does not use this particular set to adjust his training.

He talked about variation in the test and that it was especially helpful after a day off. Gave example of Popov’s best 100 set of 54.7 with 154 HR (‘long and smooth’=technique) with a test when he is off where he is 1:07 with 154HR. He talk at great length about giving athletes tools that gets them interested in important concepts in swimming and allows them to adjust to their environment. He described successful athletes who were capable in the mental aspect of psychology (the other part is will power) or using information to balance their body and vegetables/potatoes who could not.

He blamed those swimmers on the coach not giving them the tools. Main example was an understanding and interest in the importance of good technique.

Aerobic swim as generally being an example of the engine available to the athlete. MK was 140 HR for a 140 second swim. Kieren Perkins was a 130 HR for a 130 sec swim. These test are used at meets as well for the athletes to balance themselves. I think it is more a measure of physiological warm-up (he talked about HR and volume) and technique. TOURETSKI said his training and feedback system was focused on 3 factors; time of swim, heart rate and stroke count (also LA when available) Touretski felt that the recovery portion was a very creative period. HR test was done as a group and should have been done individually because they don’t take even steps for the individual and do not give the athlete or coach the best information. The athletes never race each other; it is always a positive environment.

### **Fast Swims to Start Practice**

This AIS group uses a very unusual set in training, which was quite remarkable to observe, and would likely not be endorsed by US coaches. Three or four times per week Touretski will chose one or two athletes to go a race performance off the blocks to begin practice. This swim was dry/”cold”. There is no warm-up in the water or on dryland and the performances are extremely fast. The athletes are expected to be within 1-3% of their best time. The length of the swim varies from 25 to 200 meters, but is usually a 50 or 100.

This part of the training program was discussed on several occasions with Touretski. It is a tool that he uses for several different purposes in training. The set supports his focus on consistent fast performance and the importance of competition experience. It also produces a mental toughness/expectation to swim

fast anytime under any conditions, aids in skill development at race velocities, and offers some feedback with regard to recovery status from previous training. Initially, Touretski said that the swims were all technical (“pure skill”), but then also used the analogy of a Tiger or Bull in the wild that must perform with no preparation to run, jump, or fight. This implies a connection to power development. In later conversations he describe the swims as a tool he uses to assess fatigue and how the athlete feels. It is not necessarily an all out effort. The athletes are supposed to go “whatever they feel like”. He looks the overall time and the differential between splits for the first and second half.

If the swim is relatively slow with even splits the athlete is probably aerobically fatigued, or their nervous system is not “active” (like getting up in the morning and walking (motor control) some people are good while some must get cup of coffee). If the time is slow with a large drop off there is a concern of over training or lack of motivation. If the time is fast and there is a large drop off it is considered a sign of peripheral fatigue associated with dryland or power work. If result is fast with even splits, the athlete is fully recovered and their nervous system is active.

The athletes were very comfortable with the sets and did not seem to dread selection for this swim. There was no concern of injury or question of physical readiness. They did the test and seldom discussed the results with Touretski. The athletes tended to rotate in no particular pattern. There were some extremely fast performances during these swims including a 50FR by Popov below 22 seconds.

### **Technique/Stroke Focus**

This group of athletes had superior technique and the focus on proper stroke mechanics was demanded during every portion of the water work. The only times that Touretski became frustrated and confronted athletes with negative feedback was with regard to sloppy technique or lack of discipline regarding maintaining stroke counts.

The backstrokers and freestylers had excellent rotation with no horizontal movement and high elbows in both recovery and an early catch phase.

Breaststroke and butterfly strokes were relatively flat (small amplitude) with perfect timing, exceptional flexibility, and use of body core. All strokes maintained high body position and finish hand speed.

Touretski would often take athletes out of the secondary threshold kick or pull sets and work with them individually on technique. The sessions were focused on one aspect of the stroke that was not working well and lasted between 5 and 15 minutes. The next set was often adjusted to apply the adjustments.

For example Touretski did some butterfly stroke work with Dunn and Klim on day 15. It consisted of a short conversation then closely observed 50 drills. He felt Dun was bending his knees too much during the entry portion of fly. 1st drill in the progression was single arm fly with light flutter kick working on proper leg position (rigidity) then he moved to double arm fly with flutter kick breathing every stroke and finally 10m flutter, 10m normal. Klim had similar progression to start, but finished with a sequence of 1,2,3 strokes with a glide in between on the entry. I was very impressed with the improvement in the “momentum” of his

stroke-moved well during glide.

Themes of technique work for all strokes included:

- Maintain a rigid system. Touretski talked about the importance of a rigid system moving through the water. He used the analogy of a condom when it was blown up versus when it was not and a reference to rowing/shipping technology.
- Eliminating any excess movement. Reduce horizontal body movement with rotation in Free and Back, as well as sculling motions or vibrations in pulling pattern of all strokes.
- Reduce rapid changes (acceleration) in swimming velocity.

Their skills (starts, turns, and finishes) were adequate. Turns were better than most Europeans, but not as good as many American programs. Starts were very ugly (flat with a rough entry), but dive and glides were extremely effective often reaching almost 15 meters. Finishes were technically good, but the athletes definitely swam through the wall (accelerate to finish). This results in a few short strokes, but higher velocities at the finish than most swimmers.

During this camp there were several opportunities to observe this group training at the same time as some of the top US swimmers and the technique of the AIS athlete was more efficient, more consistent, and more controlled than the US swimmers.

### **Workout Performance Log**

AIS Altitude Camp

Michael Klim

Mass has stayed between 84 and 89 kilograms for the past 4 years. DP mentioned that his sea level threshold was 1:03. GT estimated his annual training load at 2400K and that he swims 10K per day during competition (4000 wakeup swim).  
3/31 am 3x400's 4:55 HR 159 LA 4.7, 2x400's 4:43 HR166 LA 7.3, 1x400 4:29 LA10.8

4/3 am 100's FR threshold 29 stks 1:08 on rnd 1, 1:05 on rnd 2, HR at 150

100's FR threshold 1:04 29-30 stks HR 154 LA 4.6, rnd 2 1:03-1:00 30 stksHR 151-165 LA 8.3

pm 4x50 fly 26.5-25.9 from push 17 strokes 1.12-1.16

4/4 am ask to do a 50 fly fast after threshold set to work stroke at higher tempos 18 stks, 1.11/1.12

4/5 am Dive and glide 16m

pm 5x3x200's FR 30sec plus extra minute (used fingertip paddles even rnds)

lactates after rnds 1,3, and 5=2:15 LA 6.4, 2:15 HR164 LA 4.7, 2:11 LA 8.0

did half of his 20s with pull bouy and fingertip paddles FL

4/6 pm 29.0 for 50m FR with 29 strokes at the end of warm-up (set of 50s des)

did push 50 fly in 24.50 with 18 strokes and 50 c/min rate

4/7 am did push 50 free in 24.6 with 34 strokes

pm went 8:49 for 800 (700 FR/100 FL-1:04) LA 14.1, did two 50FL from push 25.7 with 19 strokes and 25.4 with 18 strokes. Commented that he was impressed

with how quickly the body adapts to altitude

4/9 am 2:20 (141), 2:15 (152), 2:05 (166)

pm first 50 FR off blocks 23.2 36 stks, rnd 1 100's ave 1:05-1:06 (32 stks LA 5.0),  
2nd rnd of 100s 1:01-1:02 (30 stks LA 8.8-GT made stroke adjustment to reduce  
stroke count), last 50 FR from push 23.9 (33stks-big legs)

4/10 am looked very tired/down, went 59.5-54.5 with LA 13.3

pm looked beat but still swam well went 58.5-54.5 (28.0/26.5) with LA 10.5

4/11 am 2:25 (134), 2:15 (151), 2:02 (164) LA 10.1, chose 3000 straight pull-went  
35:08 (LA 1.7)

with a stop to change paddles.

pm averaged 1:00.5 on 8x100 @ 1:10 with fingertip paddles (LA 11.1)

4/12 am moderate 50FL from push 27.8 with 16 strokes(6.8 BO at 13m)

pm wore sharkskin suit for testing (no Sleeves ) went 50FR to start in 22.9  
step test= 2:29.5, 2:25.3, 2:18.1, 2:06.2, 2:00.3 (29stks), 1:53.2(32stks 173)

4/13 pm went 4:30 (LA 5.0), 4:26(LA 5.8), and 4:14(LA 13.1) on the fast 400s,  
was suppose to hold 30

strokes and work anaerobic threshold, but he blasted the last 200 and GT was  
upset-will do long aerobic instead of speed work tomorrow

4/15 pm 10x100 FL @ 2:00 every other one fast odds average 1:08 evens=1:00.9,  
59.6, 58.5, 58.3 and

last 100 FL off blocks in set of 8 descend... 5.1 breakout 16 strks, stroke rates  
1.36, 1.30, 1.26 27.2 split 20 strks stroke rates 1.28, 1.20, 1.18 final time 56.5

4/17 am fast 100's 1:00.7 (32stks), 59.7 (32stks), 58.0 (32stks), 54.8 (34stks)

Alexander Popov

Came to camp two days late because he was in Switzerland for IOC meeting.

Considered somewhat out of shape and working to get back in form. Swam 48.7 at  
a meet two weeks ago after a one-week break. Mass between 91 and 93 kg, which  
is first time he has consistently been able to stay above 90kg. GT put his annual  
volume at 200K, lower than Klim's because his breaks have tended to be longer in  
recent years.

4/3 am Pulled threshold set backstroke with finger tip paddles

pm Pulled threshold set backstroke with finger tip paddles

Did not do final set of 12X50

4/4 am Pulled threshold set backstroke with finger tip paddles

4/5 am Dive and glide 14.5m

4/6 am Pulled threshold set backstroke with finger tip paddles

pm 29.0 for 50m FR with 24 strokes at the end of warm-up (set of 50s des)

Did push 50 FR in 23.6 with 26 strokes

4/7 am push 50FR 26.4 26 strokes

pm went 9:25 for 800m BK, holding 22-24 strks LA 10.1 (pulled on the laneline  
quite a bit)

4/9 am out with GI distress

pm still feeling ill, went 1st 50 FR off blocks in 24.0 with 26 stks, did 4000  
aerobic from there.

4/10 am went fast 100's with fingertip paddles, des 1:03 to 58.8 (ended with LA

10.1)

pm was OK 100's about same lactate 8.8, 200's kick 2:45 (LA 6.6)

4/11 am did last one of 200's FR (rest BK) 2:06 with 24 stks

4/12 am went 23.5 off blocks with 25 stks test to start practice

4/13 pm went 8x100 with lactates at 3,5,6,7,8 He has been doing this test for 13 years

step test=1:04 (23stks), 1:02, 1:01, 1:00, 58.7(24stks), 57.0, 53.7 (25 skts), 52.9 (26.7, 26.2)

4/14 am average 1:22 on 100s Kick FR with #3 and #6 at 1:16 and 1:15 respectively

pm went 21.64 50FR off blocks BO 3.1 at 11m 32 stks rate .55,.56,.56 swam 2000 and got out

4/15 pm 10x100 FR @ 2:00 every other one fast odds average 1:09 evens=57.9,58.7,59.1, 57.2, 54.4

4/17 am went BK with finger tip paddles last 100 fast was 58.8

### Matthew Dunn

Did large amount of BK during camp as it was considered weak stroke. Started swimming because of asthma and is still on heavy meds, the only day I noticed him having trouble was after a rapid weather change-cold to hot.

3/31 am 3x400's 4:40 31 stks HR 151 LA 2.4, 2x400's 32 stks 4:28 HR165 LA 5.6, 1x400 4:14 HR174 LA 8.6

4/3 am 100's BK threshold 31 stks 1:11 on rnd 1, 1:10 on rnd 2, HR at 155

pm 100's BK threshold 32stks 1:10 on rnd 1 HR 155 LA 2.9, rnd 2 1:07 HR 32 stks, HR164 LA 3.6

4/4 am 800 FR 9:12 (143/105/83) LA 2.3, 800FR 8:54 (158/131/94) LA (4.6)

4/5 am Dive and glide 15m

pm 5x3x200's BK 30sec plus extra minute lactates after rnds 1,3, and 5=2:25 LA 3.0, 2:24 HR158 LA 3.2, 2:21 LA 3.8

4/6 pm his primary workout-GT hounded him on the sets of 150s, first rnd was 50FL/100BK, GT

wanted back at 1:11-1:12 and felt he should back off the fly to get to anaerobic threshold. Did second set FR holding 1:34 with HR 164 and LA 3.3

4/7 pm Went 16:36 for 1500FR holding 36-37 stks with LA 5.7

4/9 am out with GI distress

pm still feeling ill, went 50FL off blocks in 27.0, 1st rnd 100s 1:04-1:05 (31 stks LA 2.8), 2nd rnd 1:00-1:01 (32stks LA 5.7)

4/10 pm GT very happy with threshold BK averaged 1:10 with LA 3.8, did FL on first 2 fast 100s (1:02

and 1:03) then switched to FR (1:02, 1:00. 58.5)

4/11 am 2:23 (), 2:13(), 2:01()

4/12 pm wore sharkskin suit (no sleeves) FR for step test-he looked physically different in the water with the suit on -higher. step test=2:20, 2:13, 2:10, 2:05, 2:00, 1:54.2

4/15 pm 10x100 FR @ 2:00 every other one fast odds average 1:08 evens=54.6, 55.2,56.1,56.9. 54.5

4/17 am went 2xbroken 400 IM working on technique after practice (2x50 FL 22stks, 29.8, 30.3),  
100BK 1:08.1, 2x50 BR (36.4, 36.8), 100FR 59.7 15sec rest total time=4:21.2

Edward Roche

Believe he has made outstanding progress in training, but is not good in competition (nervous). Believes if he changes butterfly he could be good in that stroke ... "perfect kick".

3/31 am 3x400's BK 5:11 HR 150 LA 1.9, 2x400's 4:51 HR161 LA 3.3, 1x400 4:34 LA 8.8

4/3 am 100's BK threshold 28 stks 1:09 on rnd 1, 1:08 on rnd 2, HR at ???  
pm 100's Bk threshold 31stks 1:08 on rnd 1 LA 2.2 HR 161, rnd 2 1:06 30 stks HR 165 LA 5.2

50m kick with mono fin in 17.6

4/4 am 800BK 10:34 (136/102/100) LA 1.3, 800BK 9:59 (155/108/85) 1.8

4/5 am Dive and glide 14m

pm 5x3x200's BK 30sec plus extra minute lactates after rnds 1,3, and 5=2:23 LA 2.6, 2:20 HR170 LA 3.4, 2:19 LA 4.3

4/7 pm went 9:14 for 800 BK LA 7.1 holding 33 to 34 strks, went push 50 BK in 26.7

4/9 am went 2:25, 2:21, and 2:15

pm wore speedo shark-skin suit for first 500 of practice full body, though he usually prefers briefs, 50 off blocks BK in 26.9 with suit, 1st rnd 100s 1:08-1:09 (33 stks LA 3.6) 2nd rnd 100's 1:05-1:06 (34 stks LA 6.7), went 50 BK at end in 27.4

4/10 am swam very well in all set 100's BK (1:01-58.8) LA 8.0

4/11 am went 2:29, 2:23, 2:18

pm averaged 1:07.0 BK on 8x100 @1:20 with fingertip paddles (LA 4.7) GT happy with work, went fast

50 at end in 26.4 BK

4/12 am went 2:32 with 143 HR to start practice GT felt that was not a good result, based on other

swims...should be 2:20...WHY?

Pm BK step test= 2:37, 2:30, 2:25, 2:22, 2:18, 2:13, 2:08, was somewhat disappoint he felt he should be going faster based on his swimming earlier in the week.

4/15 pm 10x100 BK @ 2:00 every other one fast odds average 1:10

evens=1:00.8,1:00.4, 59.5, 59.4, 58.8

4/17 am fast 100's 1:03.2, 1:02.7, 1:02.0, 1:00.9

Sarah Ryan

Very powerful build, narrow hips and small upper body

Consistent 7m of dolphin kick off wall in turns.

3/31 am 3x400's 5:11 HR 169 LA 3.0, 2x400's 4:59 HR179 LA 5.6, 1x400 4:42 180 LA9.9

4/3 am 100's FR threshold 32 stks 1:14 on rnd 1, 1:12 on rnd 2, HR at 160+  
100's FR threshold 32stks 1:11 on rnd 1 LA 3.2, rnd 2 1:08 HR 174 LA 4.0

4/4 pm 800 FR 10:34 31-32 (50 FR in build 800 35 stk .85)

4/5 am Dive and glide 13.5m

pm 5x3x200's FR 30sec plus extra minute lactates after rnds 1,3, and 5=2:24 LA 5.8, 2:25 HR176 LA 6.1, 2:24 LA 7.7

4/6 pm concerned about skin folds so changed strength workout.

4/7 am did times 800 in the morning because they wanted to fitness work with the group went 9:57 (started in 1:04 with 33 strokes and went to 1:18 with 39-ouch) LA 12.1.

pm GT felt she needs more fitness so extended her strength workout (arms) she came in late and swam 500m easy.

4/8 am went 2:31, 2:25, 2:20

pm first 50 FR 26.7, 1st rnd 100s 1:08-1:09 (34 stks LA 7.6) 2nd rnd 100's 1:05-1:06 (35 stks LA 9.8), went 50 FR at end in 27.8 (36stks)

4/10 am had good controled workout swam 100's fast (1:05-1:03.3 LA 6.6), went best dive 25 fly 11.9

in last swim.

pm got a massage right before practice and had best one to date 100s (1:02-1:00)

4/11 am went 2:35, 2:23, 2:13 (7.7)

pm averaged 1:10.5 on 8x100 @1:20 with fingertip paddles (LA 6.7)

4/12 am went 2:21 200 FR to start workout with 150 HR

pm step test=2:43, 2:40, 2:32, 2:27, 2:22, 2:15, 2:09.4

4/15 pm 10x100 FR @ 2:00 every other one fast odds average 1:10 evens=1:00.8,  
 1:02.5, 1:03.5, 1:03.5, 59.7

**TRAINING TYPE BREAKDOWN  
 AIS AT TITUS CAMP**

WORKOUT	TOTAL	SWIM	KICK	DRILL	PULL	OFF STROKE	WORKOUT	TOTAL	SWIM	KICK	DRILL	PULL	OFF ST
March 28, 2000 TUE							April 8, 2000 SAT						
AM							AM	OFF					
PM	TRAVEL						PM	OFF					
March 29, 2000 WED							April 9, 2000 SUN						
AM	8000	3000	800	0	1800	1000	AM	8800	3000	900	300	2400	1300
PM	5000	1000	800	1000	1900		PM	7400	4000	1900	500	1800	900
March 30, 2000 THU							April 10, 2000 MON						
AM	1900	2900	900	500	1700	1000	AM	8200	4000	1300	500	1900	500
PM	9000	4100	900	200	900	1200	PM	7200	4100	1600	900	1000	900
March 31, 2000 FRI							April 11, 2000 TUE						
AM	6000	4700	800		1000	800	AM	7400	4100	1000		3000	900
PM	OFF						PM	7000	5400	400		1700	1000
April 1, 2000 SAT							April 12, 2000 WED						
AM	8000	7000	900		400	1200	AM	6000	1000	1000		3000	1000
PM	7000	4500	1000	1000	1000		PM	OFF					
April 2, 2000 SUN							April 13, 2000 THU						
AM	8200	5200	400		1600	400	AM	6900	3600	800	1300	1200	500
PM	6500	4500	500	500	500		PM	5000	3200	500	800	500	500
April 3, 2000 MON							April 14, 2000 FRI						
AM	7900	6300	400	900	1200		AM	8000	3600	900	900	2100	800
PM	5900	3600	800	800	800		PM	5900	5000	400	400		900
April 4, 2000 TUE							April 15, 2000 SAT						
AM	6000	5200	400	400	400		AM	6000	3000	1400	200	900	200
PM	OFF						PM	OFF					
April 6, 2000 WED							April 16, 2000 SUN						
AM	6600	2800	400		2000	1200	AM	OFF					
PM	8000	6700	1000	500		500	PM	4800	3400	400	400	400	500
April 8, 2000 THU							April 17, 2000 MON						
AM	8000	9200	900		1000	1400	AM	6600	3100	800	400	1200	1000
PM	7000	5000	300	800	400	800	PM	6100	1800	1200	800	1000	300
April 7, 2000 FRI							April 18, 2000 TUE						
AM	6200	2000	1200	900	900	1400	AM	6000	2200	1000	400	1200	1000
PM	3000	1800	500	500	500	500	PM	TRAVEL					
<b>CAMP</b>	<b>TOTAL</b>	<b>SWIM</b>	<b>KICK</b>	<b>DRILL</b>	<b>PULL</b>	<b>OFF STROKE</b>							
	212,170	136,170	29,900	11,700	28,200	21,900							
		62.10%	12.80%	5.50%	13.11%	10.11%							

NOTE: OFF STROKE APPLIES TO DESIGNATED NON-FREESTYLE SWIMMING IN PRACTICE (SLIM, RYAN, AND POPCIN)

4/17 am fast 100's 1:03.1, 1:03.7, 1:04.0, 1:02.9

**USA SWIMMING ENERGY SYSTEM BREAKDOWN  
AIS ALTITUDE CAMP**

WORKOUT	TOTAL	FN1	FN2	FN3	SP1	SP2	SP3	WORKOUT	TOTAL	FN1	FN2	FN3	SP1	SP2	SP3
March 28, 2000 TUE								April 8, 2000 SAT							
AM								AM	OFF						
PM								PM	OFF						
March 29, 2000 WED								April 9, 2000 SUN							
AM	5000	4750				250		AM	8800	5120	1200			100	18
PM	5000	4400	500			100		PM	7400	4950	1500	800		50	10
March 30, 2000 THU								April 10, 2000 MON							
AM	5800	4470	1200			180		AM	8200	4075	3500		500		12
PM	8000	4480	1200			50	320	PM	7300	4800	1200	400	700	300	10
March 31, 2000 FRI								April 11, 2000 TUE							
AM	8500	3800	2000	800			100	AM	7100	8100	800	200			
PM	OFF							PM	7000	4750	800	1200		100	15
April 1, 2000 SAT								April 12, 2000 WED							
AM	8000	4900	2900			100	100	AM	5000	4500	500				
PM	7000	5280	1400				320	PM	OFF						
April 2, 2000 SUN								April 13, 2000 THU							
AM	8200	5450	2700			50		AM	8900	5550	2400	400		200	35
PM	8900	4480	1800	500			120	PM	5000	3000	900	350	200	200	35
April 3, 2000 MON								April 14, 2000 FRI							
AM	7800	5200	2400				200	AM	8000	5140	2700				18
PM	5800	5040	2500			50	210	PM	5800	2200	2800	800			
April 4, 2000 TUE								April 15, 2000 SAT							
AM	8500	3800	2400				200	AM	8000	4075	800	500	500		12
PM	OFF							PM	OFF						
April 5, 2000 WED								April 16, 2000 SUN							
AM	5500	4850	500			50	300	AM	OFF						
PM	8000	3800	3700			50	450	PM	4800	2700	1200	800	400	100	10
April 6, 2000 THU								April 17, 2000 MON							
AM	8000	4050	3800				150	AM	5500	3250	1800	800	0	0	50
PM	7000	2940	3500	500			360	PM	5100	3820	1000			100	18
April 7, 2000 FRI								April 18, 2000 TUE							
AM	5200	3500	1200	400			100	AM	5000	4100	800				10
PM	3000	1800	500	800			100	PM	TRAVEL						
CAMP	<b>TOTAL</b>	<b>FN1</b>	<b>FN2</b>	<b>FN3</b>	<b>SP1</b>	<b>SP2</b>	<b>SP3</b>								
	213700	138270	57900	8850	2300	1500	3580								
		64.70%	27.08%	4.05%	1.08%	0.70%	1.87%								

NOTES: POPOV ARRIVE 2 DAYS LATE DUE TO IOC MEETINGS  
POPOV AND DUNN MISSED PRACTICE ON THE MORNING OF APRIL 9TH DUE TO ILLNESS (GI DISTRESS)